National Park Service
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Natural Resource Stewardship and Science

Small Mammal Inventory and Bat Reconnaissance at Fort Vancouver National Historic Site/ Vancouver National Historic Reserve

Natural Resource Technical Report NPS/NCCN/NRTR—2012/590

ON THE COVER
Chief Factor's house, Fort Vancouver National Historic Site
Photograph by: Marv Binegar/NPS

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June 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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Please cite this publication as:

Schaberl, J., E. Myers, and M. Reid. 2012. Small mammal inventory and bat reconnaissance at Fort Vancouver National Historic Site/Vancouver National Historic Reserve. Natural Resource Technical Report NPS/NCCN/NRTR—2012/590. National Park Service, Fort Collins, Colorado.

NPS 389/115023, June 2012

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Abstract

From June 23-28 and on August 6, 2002, Mount Rainier Wildlife Program staff conducted a small mammal inventory, a rapid assessment of bat species, and documented the presence of other mammals in the area at Fort Vancouver National Historical Site (FOVA) and parts of the Vancouver National Historic Reserve (Reserve). Our small mammal inventory focused on live trapping in seven habitat types for 600 trap-nights. We captured 74 unique individuals of five different species (+ two unknown) and documented two additional species incidentally. The most frequently-trapped species was the deer mouse (*Peromyscus maniculatus*). We collected eight voucher specimens to include at least one of each of the five species trapped. We were unable to capture bats in one night of mist-netting in the Reserve but did identify big brown bat (*Eptesicus fuscus*) calls using an electronic bat detector and visually documented likely two different *Myotis* species.

Acknowledgments

We thank Tracy Fortman and Elaine Huff for their assistance in logistics and accommodations at FOVA for the duration of the study. Also appreciated was the hard work of the field crews on the project, including Christine Garces, Jason Lovelady, and Eva Patton. The project was funded from the NPS Natural Resource Challenge, Inventory and Monitoring Program.

Introduction

Scope

In 1998, Congress passed the National Parks Omnibus Management Act that recognized the need for credible scientific information to manage parks. In recognition of the general lack of basic information on what biological resources occurred in parks and what the status of the resources were, the Act directed the NPS to create an inventory and monitoring program to establish baseline information and to provide information on the long-term trends in condition of natural resources throughout the NPS. The resultant congressionally funded Service-wide Inventory and Monitoring (I&M) Program provides funds to park Networks, such as the North Coast and Cascades Network (NCCN) to conduct biological inventories and long-term monitoring (NPS 1999). The basic goal of the inventory portion of the program was to document through existing data and targeted field investigations the occurrence of at least 90 percent of the species of vertebrates and vascular plants currently expected to occur in the park. The I&M program views inventories as iterative processes, whereby an initial effort is conducted, after which further additions and refinements to these initial inventories can be made during more in-depth investigations funded by various sources, including the national program.

The North Coast and Cascades Network of parks identified an Inventory Plan in 2001 to address baseline biological resource documentation needs (Rochefort et al. 2009). These inventories generally focused on vascular plants and vertebrates. A small mammal inventory was one of the products identified as needed for Fort Vancouver National Historic Site (FOVA). The NCCN Inventory Plan (2009) specified that mammal surveys at "small" parks like FOVA have complete sample coverage and use a variety of methods to document species. Our effort was even smaller in scope than what is specified in the NCCN Inventory Plan (2001) for at least three reasons: 1) suitable mammal habitat was patchy and often situated in an intensively-managed cultural landscape, 2) the Mount Rainier National Park (MORA) Wildlife Ecologist, the Principal Investigator for this inventory, was a vacant position during the final planning and primary implementation phase of the project, and 3) the NCCN Inventory Plan greatly underestimated/underfunded the costs of a more complete inventory.

We found no records of mammal inventories for the FOVA area. A brief Wildlife Resources Report completed by the U.S. Fish and Wildlife Service (Benvenuti 1993) included a field inspection of the site, an observed species list, and a hypothetical list of vertebrates that may use FOVA.

The objectives of our inventory were to document small mammals present at FOVA and obtain voucher specimens of representative species. For the purposes of this inventory, we included insectivores, rodents, and bats. Larger mammals were not sampled in this inventory; however, we included incidental collections and observations of a few mid-size mammals.

Study Area

FOVA is located in southwestern Washington along the north shore of the Columbia River. FOVA was established by Congress in 1948 initially as a National Monument to protect and maintain "the site of the original Hudson's Bay stockade and sufficient surrounding land to preserve the historical features of the area" for the benefit of the people. In 1961 the Monument's boundaries were enlarged and Fort Vancouver was redesignated a National Historic Site. The site consists of buildings and approximately 200 acres of maintained historic landscapes, lesser-maintained lands, and small areas of disturbed riparian and upland area.

FOVA is a key component of Vancouver National Historic Reserve, a complex of lands adjacent to and including the Columbia River Waterfront and managed by an assemblage of partners. FOVA is primarily a built landscape with a mowed, park-like environment that hosts urban wildlife. Disturbed riparian areas and old field habitats provide for a larger variety of species than the highly managed landscapes/lawns. Some of these habitats are outside of FOVA but on Reserve lands.

Before the establishment of Hudson's Bay Company, native people were present along the Columbia River and harvested various plants and wildlife, from large mammals such as deer to possibly small passerine and shorebirds (Benvenuti 1993). The more widespread and intense development of this area began approximately 180 years ago with the establishment of Hudson's Bay Company and continued with the U.S. Army improvement and expansion of its post and which is actively maintained today. In addition to what is now FOVA, the surrounding area was historically managed as a matrix of agricultural pastures and crops. Since the area has been highly modified for at least two centuries, it is difficult to determine the wildlife species present prior to settlement. It is presumed that much of the area along the Columbia River was an undisturbed riparian and wetland zone and beyond was a large expanse of Northwestern coniferous forest.

Presently the area managed by FOVA primarily consists of mowed lawns with nonnative trees and vegetation, interspersed with small planted areas (such as the historic garden and croplands) and small areas of infrequent management where nonnative species grow (the areas along the Columbia River and the brushy area to the west of the Fort). Although more wild in appearance, these areas of infrequent management contain many exotics, provide marginal wildlife habitat, and may have served in the past as debris dumping grounds (Benvenuti 1993). The planted areas and areas of infrequent management are the two areas of greatest wildlife species diversity at FOVA.

Methods

Small Mammal Trapping

We trapped for four consecutive nights from the 24th through the 28th of June, 2002. We selected seven areas within FOVA and the Reserve for small mammal trapping based on vegetation (Figures 1a and 1b). Trapping stations were distributed in the following different vegetative types: 1) *Agricultural*, planted barley harvested yearly,(Figure 2), 2) *Short Grass*, occasionally mowed disturbed old field (Figure 3), 3) *Tall grass*, (park staff referred to this as tall grass fescue but it is not confirmed) (Figure. 4), 4) *Brambles*, Himalayan blackberry and Scotch broom (Figure 5), 5) *Columbia River waterfront edge*, rocky debris with cottonwoods and Himalayan blackberry understory (Figure 6), 6) *Freshwater wetland*, along the Columbia River (Figure 7), and 7) *Sandy beachfront*, lined with willows/cottonwoods along the Columbia River (Figure 8). We did not sample the majority of FOVA that included highly disturbed, cultivated, and manicured vegetated areas (lawn) where small mammals are removed on a regular basis by grounds keeping staff and many nonnative trees are growing.

Traps were set in transects rather than grids or webs because much of the habitat suitable for trapping was linear. Transects have been recommended for the inventory of small mammals where the primary concern is inventorying all species and estimating absolute abundance or density is not necessary (Wilson et al.1996).

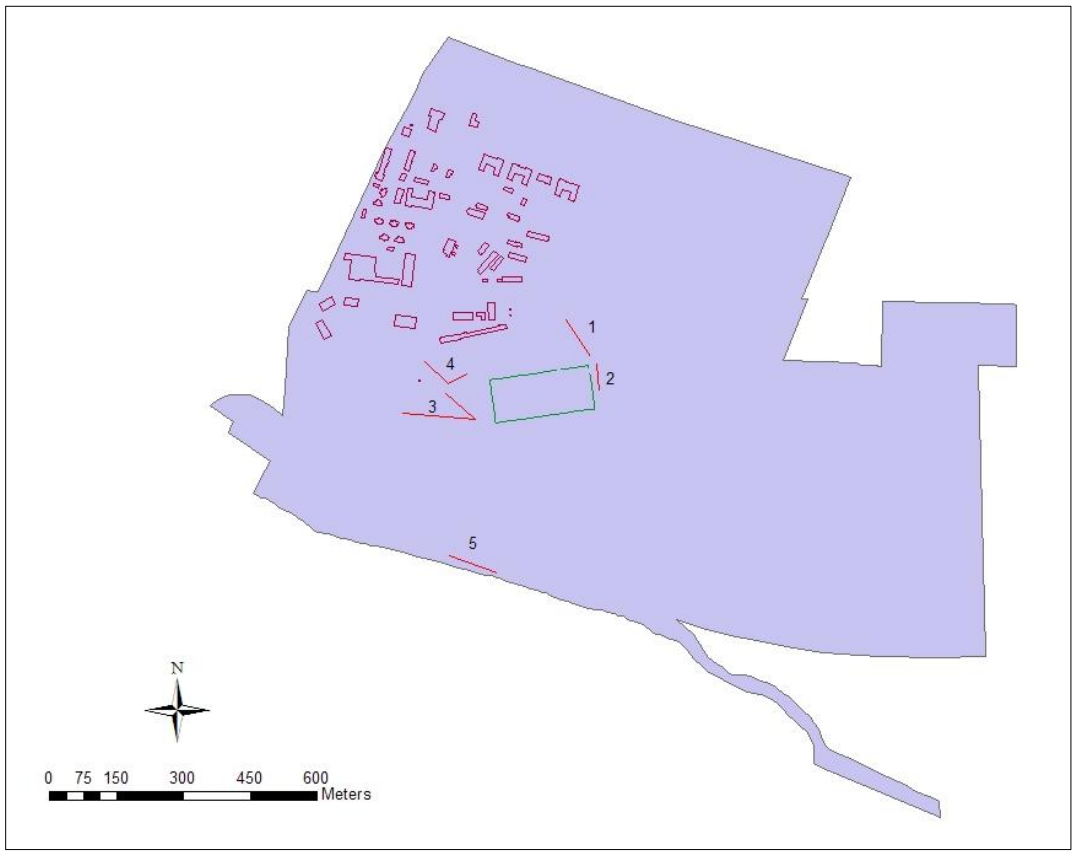

Figure 1a. Layout of small mammal trapping transects, Fort Vancouver National Historic Site (west). Stockade (green) and barracks (red) are included for reference.

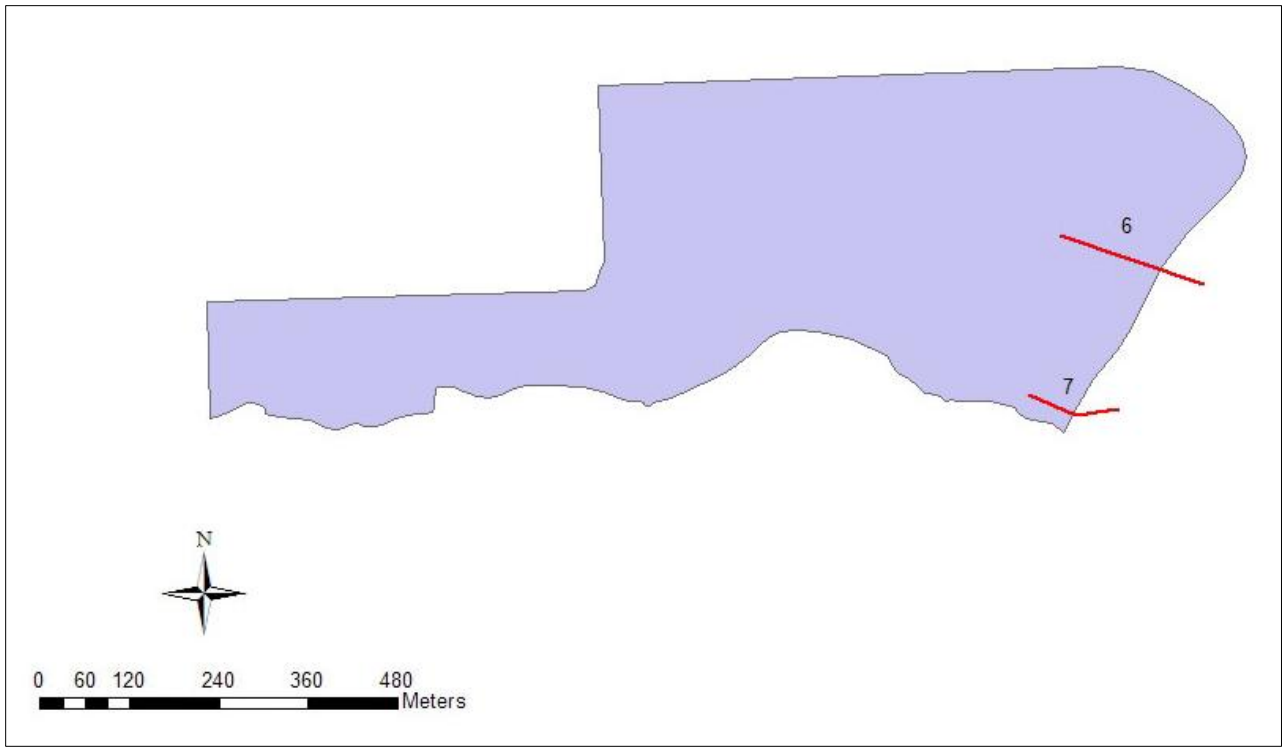

Figure 1b. Layout of small mammal trapping transects, Fort Vancouver National Historic Site (east).

Figure 2. Transect 1, planted barley.

Figure 3. Transect 2, short grass.

Figure 4. Transect 3, tall grass.

Figure 5. Transect 4, brush.

Figure 6. Transect 5, vegetated waterfront.

Figure 7. Transect 6, wetland.

Figure 8. Transect 7, sandy beach.

Trapping stations were spaced at 10m intervals. One medium (7.6 x 7.6 x 30cm) and one small (7.6 x 7.6 x 22.8cm) Sherman type live trap were placed at each station. Traps were faced in opposite directions, opened, baited at dusk with peanuts and rolled oats, and a cotton ball was provided for insulation. Traps were not prebaited. Traps were checked at dawn, and captures were identified to species when possible, sexed, aged, weighed, and marked with hair dye or permanent marker to permit recognition of recaptured animals. Observations regarding deaths,

injuries, parasitism, and deformities were also noted. At least one representative voucher specimen was collected for each species trapped.

Bat Reconnaissance

We conducted our reconnaissance during the evening of August 6, 2002 using simultaneously both conventional netting techniques and ultrasonic echolocation detection technology. We identified only one suitable site for netting – approximately 200m south of the Reserve Education Center near Transect 6 (Figure 1b). We identified two broad potential funneling areas over foraging habitat. We set up two mist nets and opened the nets at 20:54 hrs and 21:10 hrs respectively. Nets were left open for a period of 2.5 hours.

An Anabat II bat detector (Titley Scientific, Columbia, MO) was used to detect bat calls. The Anabat detector is a countdown type recorder designed specifically for identifying microchiropteran bats by the pulse rate and time pattern of the dominant frequency of their calls (Hayes and Hounihan 1993). We listened to audio calls and were able to coarsely distinguish *Myotis* from a non-*Myotis* group, based on the characteristic frequency of the *Myotis* calls and observation of behavior, relative size, color, wingbeats, etc. (Petterson 2009).

Results

Small Mammals

During 600 trap nights, a total of 122 small mammals were captured, representing 74 individuals of five species (Tables 1 and 2). Capture rates varied between 0.45 and 0.70 animals/trap-night. Three invertebrates were also captured. Species diversity of small mammals varied between one and three species per site. Three small mammals escaped during handling before all biological data were obtained, and one trapping mortality, a shrew, occurred during the study. Eight voucher specimens were collected, one of these obtained by collecting an animal hit and killed by a vehicle (Appendix A).

Table 1. Summary of trapping effort at Fort Vancouver National Historic Site, June 24-28, 2002.

Site	Habitat type	No. Stations	No. Traps	No. Nights	Trap nights
1	Agricultural field	9	18	4	72
2	Disturbed old field	6	12	4	48
3	Uncut Tall grass (fescue?)	10	20	4	80
4	Blackberry, Scotch broom	11	22	4	88
5	Freshwater river edge, Cottonwoods	10	20	4	80
6	Freshwater wetland	13	26	4	104
7	Mixed Willow, Cottonwood sandy beach freshwater edge	12	24	4	96
Total		**71**	**142**	**28**	**600**

Table 2. Species of small mammals documented in FOVA, 2002. The eastern cottontail was documented by photo only, and the grey squirrel was a vehicle mortality.

Common Name	Species
Creeping vole	*Microtus oregoni*
Deer mouse	*Peromyscus maniculatus*
Vagrant shrew	*Sorex vagrans*
Townsend vole	*Microtus townsendi*
House mouse	*Mus musculus*
Eastern cottontail rabbit*	*Sylvilagus floridanus*
Eastern grey squirrel**	*Sciurus carolinensis*

Table 3. Summary of site-specific trapping data from FOVA for all species combined.

Site	Description	Species	Captures	Trap Nights	Captures / Trap-Night	No. Indiv.	Recaptures	Other Species
1	Planted Barley plot	2	3	78	0.04	2	1	
2	Mixed Short grass	0	0	51	0.0	0	0	
3	Tall Fescue grass field	0	0	86	0.0	0	0	
4	Exotic Brambles Brushy Edge	1	27	89	0.30	17	10	1 millipede
5	Columbia River Rocky Waterfront	2	21	88	0.24	13	8	1 slug, 1 beetle
6	Columbia River Wetland	3	50	112	0.45	33	17	
7	Columbia River Edge Sandy Beach	2	21	96	0.22	11	10	
Total		**5**	**122**	**600**	**0.17**	**76**	**46**	**3**

Table 4. Trapping results by species from FOVA.

Species	No. Captures	No. Indiv.	No. Recap.	Sex M	Sex F	Sex U
MIOR – *Microtus oregoni*	1	1	0	0	1	0
PEMA – *Peromyscus maniculatus*	116	68	46	29	34	5
SOVA – *Sorex vagrans*	2	2	0	0	2	0
MITO - *Microtus townsendii*	2	2	0	0	2	0
MUMU- *Mus musculus*	1	1	0	1	0	0
Totals	**122**	**74**	**46**	**30**	**38**	**5**

The deer mouse was by far the most abundant species trapped at each site (Tables 4-8) and accounted for 95% of the total numbers of animals trapped. Sex ratios were somewhat evenly matched at sites, with only slightly more females than males being captured. The freshwater wetland site along the Columbia River yielded the highest species diversity, (with three species being documented), abundance of deer mice, and captures/trap night.

Table 5. Trapping results for Planted Barley transect from FOVA.

Species	Total Captures	Unique Individuals	Recaptures	Mortalities	# of Captures By Sex M	F	U
MIOR							
PEMA	2	1	1		1		
SOVA							
MITO							
MUMU	1	1		1	1		
Total	**3**	**2**	**1**	**1**	**2**		

Table 6. Trapping results for Mixed Short Grass transect from FOVA.

Species	Total Captures	Unique Individuals	Recaptures	Mortalities	# of Captures By Sex M	F	U
MIOR							
PEMA							
SOVA							
MITO							
MUMU							
Total	**0**						

Table 7. Trapping results for Tall Fescue Grass Field transect from FOVA.

Species	Total Captures	Unique Individuals	Recaptures	Mortalities	# of Captures By Sex		
					M	F	U
MIOR							
PEMA							
SOVA							
MITO							
MUMU							
Total	**0**						

Table 8. Trapping results for the Exotic Brambles Brushy Edge transect from FOVA.

Species	Total Captures	Unique Individuals	Recaptures	Mortalities	# of Captures By Sex		
					M	F	U
MIOR							
PEMA	27	17	10		10	7	
SOVA							
MITO							
MUMU							
Total	**27**	**17**	**10**		**10**	**7**	

Table 9. Trapping results for the Columbia River Rocky Waterfront transect from FOVA.

Species	Total Captures	Unique Individuals	Recaptures	Mortalities	# of Captures By Sex		
					M	F	U
MIOR	1	1		1		1	
PEMA	20	11+1 unk	8	1	7	4	1
SOVA							
MITO							
MUMU							
Total	**21**	**12+1unk**	**8**	**2**	**7**	**5**	**1**

Table 10. Trapping results for the Columbia River Wetland transect from FOVA.

Species	Total Captures	Unique Individuals	Recaptures	Mortalities	# of Captures By Sex		
					M	F	U
MIOR							
PEMA	47	29+1 unk	17		8	20	2
SOVA	1	1		1		1	
MITO	2	2		1		2	
MUMU							
Total	**50**	**32+1 unk**	**17**	**2**	**8**	**23**	**2**

Table 11. Trapping results for the Columbia River Edge Sandy Beach transect from FOVA.

Species	Total Captures	Unique Individuals	Recaptures	Mortalities	# of Captures By Sex		
					M	F	U
MIOR							
PEMA	20	10	10		5	3	2
SOVA	1	1		1		1	
MITO							
MUMU							
Total	**21**	**11**	**10**	**1**	**5**	**1**	**2**

Bats

The detection of bats was limited to identification of a big brown bat (*Eptesicus fuscus*) heard on the Anabat and visual observations of what was thought to be big brown bats and unidentified *Myotis* species. No bats were captured during the night of August 6, 2002.

Discussion

The primary objective of this inventory was to document small mammal species presence. Of the 34 species of mammals hypothesized to be at FOVA (Appendix B), 15 of them could be considered to be "small mammals." This study documented five small mammal species with an additional two unconfirmed. At least two species of bats were documented using bat detectors.

The species richness varied from zero to three species per site. The site with the highest capture rates was the area of least disturbed plant communities, the wetland by the Columbia River. This site, however, is by no means undisturbed. Most of the transect sites contained many species of exotic plants and were recovering from relatively recent disturbance or were planted with cultivated grass/grain species. Due to the high degree of development and disturbance over the history of FOVA, it is unlikely there still exists any high degree of species richness.

The limited inventory is not necessarily a good indication of species diversity or abundance at FOVA as only small and medium sized Sherman live traps were used, trapping was only done for 4 consecutive nights, and species identification was based on outward characteristics and live field measurements. Modest additional sampling effort would be necessary to further document the remainder of species occurring at FOVA.

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Appendix A. List of small mammals collected/seen during 2002 inventory.

Species	Common Name	Transect	Voucher Number	Death
MIOR – Microtus oregoni	Creeping vole	5	FOVA 6	Human caused
PEMA – Peromyscus maniculatus	Deer mouse	4	FOVA 1	Human caused
PEMA – Peromyscus maniculatus	Deer mouse	5	FOVA 2	Human caused
SOVA – Sorex vagrans	Vagrant shrew	6	FOVA 7	Trap death
SOVA – Sorex vagrans	Vagrant shrew	7	FOVA 5	Human caused
MITO – Microtus townsendii	Townsend vole	2	FOVA4	Human caused
MUMU – Mus musculus	House mouse	1	FOVA 3	Human caused
SCCA – Sciurus carolinensis	Eastern grey squirrel	None, E. 5th St.	FOVA 8	Hit by vehicle
SYBA – Sylvilagus floridanus	Eastern cottontail	None, near Transect 4	Photo only	Visual only, not collected

Appendix B. Hypothetical list of species that may occur at Fort Vancouver National Historic Site (Benvenuti 1993).

APPENDIX D. HYPOTHETICAL LIST OF SPECIES THAT MAY OCCUR AT FORT VANCOUVER NATIONAL HISTORIC SITE

This list is composed of species known to inhabit the Vancouver area and for which there is habitat at Fort Vancouver National Historic Site that could support the species at least occasionally. Other species are possible and it is unlikely that all of the species listed actually inhabit the site. The list includes aquatic species that might be observed from the waterfront. Species not native to the area are identified by *.

Mammals

Names and order follow "Mammals of North America" buy E. Raymond Hall.

MARSUPIALS
* Virginia Opossum

MOLES AND SHREWS

Masked Shrew	Coast Mole
Pacific Water Shrew	Dusky Shrew
Water Shrew	Vagrant Shrew
Shrew-Mole	

BATS

Big Brown Bat	Silver-haired Bat
Hoary Bat	California Myotis
Long-eared Myotis	Little Brown Myotis
Long-legged Myotis	Yuma Myotis

CARNIVORES

Coyote	Raccoon
Mink	Long-tailed Weasel
Striped Skunk	Spotted Skunk

RODENTS

Beaver	Brush Rabbit
Western Pocket Gopher	Northern Pocket Gopher
Deer Mouse	Creeping Vole
Long-tailed Vole	Townsend's Vole
Pacific Jumping Mouse	Muskrat
Western Gray Squirrel	* Nutria

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NPS 389/115023, June 2012

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